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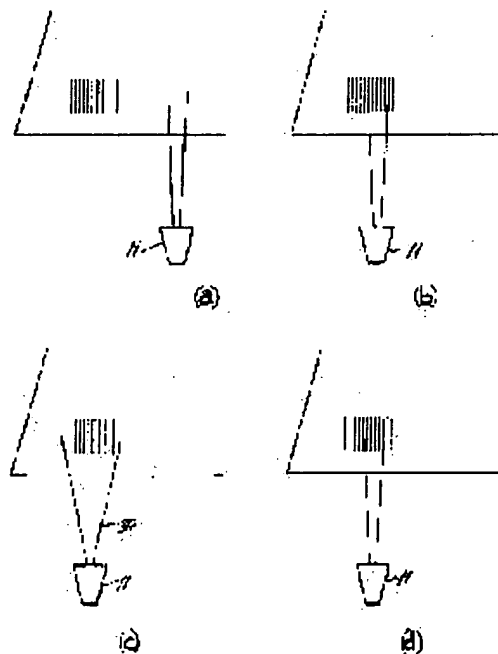
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## (54) SCANNING DEVICE FOR ADJUSTING OPTICAL OUTPUT AND SCANNING ANGLE AND ITS METHOD

(57)Abstract:

**PROBLEM TO BE SOLVED:** To Judge whether or not reflection light from a sign expresses the space change of different reflection rates capable of indicating a prescribed sign pattern in a sign scanning device for reading the sign such as a barcode sign.

**SOLUTION:** A laser beam 30 having a narrow extending angle for permitting a part of the sign to be read to be exposed of having a wide extending angle for scanning the whole sign to be read during a succeeding second period by permitting the spot-state laser beam to be generated during the first prescribed period and to be radiated to the sign is generated.



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**CLAIMS**

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[Claim(s)]

[Claim 1] In order that a user may enable it to turn a laser beam towards desired Have the narrow flare angle applied to a part of notation read, or a spot-like laser beam is generated during the first period. A laser beam with the big flare angle which scans the whole notation read is generated during the second [ after said first period ] period. a scan means to inject, and a detection means to generate the electrical signal corresponding to the data expressed with said notation in response to the light reflected with said notation -- since -- the equipment for reading the bar code notation characterized by becoming.

[Claim 2] It is equipment characterized by having been equipment indicated to claim 1, for said scan means moving said laser beam on the 1st scan way, and moving said laser beam on the 2nd scan way, generating [ said flare angle is narrow or to generate a spot-like laser beam, ] a laser beam with said big flare angle, and coming to read said notation.

[Claim 3] The actuation to which it is equipment indicated to claim 2, said 2nd scan way is longer than said 1st scan way, and said laser beam is moved along said 1st scan way, and the actuation to which said laser beam is moved along said 2nd scan way are equipment which came to be performed alternatively.

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**DETAILED DESCRIPTION**

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**[Detailed Description of the Invention]****[0001]**

**[Industrial Application]** Generally, the semi-conductor light source is used for this invention, more, in a detail, the strength or spatial range of a bundle of rays is adjusted, and it relates to the laser scanner which reads the sign from which reflection factors, such as a bar code notation, differ, and the scanner which performs detection and read of a sign.

**[0002]**

**[Description of the Prior Art]** Various kinds of laser scanners for reading a bar code notation are known for this field. The bar code notation which carried out digital display of the information which identifies the description of the article or others is attached to the front face or label of an article. The bar code notation itself is the coded sign pattern which consists of a series of rod notations of various width of face which touched the null and boundary of various width of face, set spacing mutually, and has been arranged. U.S. Pat. No. 4,251,798 -- said -- the 4,360,798th a number -- said -- the 4,369,361st a number -- said -- the 4,387,297th a number -- said -- the 4,593,186th a number -- said -- the 4,496,831st a number -- said -- the 4,409,470th a number -- said -- the 4,460,120th a number -- said -- the 4,607,156th a number -- said -- the 4,673,803rd The scanner of various configurations is indicated by the number. Generally, these scanners are designed so that the bar code notation of a Universal Product Code (UPC) method may be read, and they are used for them for a fixed distance, i.e., read distance, in the location where the stock was location [ the stock ] or fixed, setting from a bar code notation. Generally, the scanner is equipped with the light sources, such as laser which takes out a bundle of rays, or a semiconductor device. A bundle of rays is optically corrected so that the luminescent spot of fixed magnitude may be formed. As for the magnitude of the luminescent spot, it is desirable to make it the same as the minimum width of face between the fields of a different reflection factor, i.e., the rod of a bar code notation and the minimum width of face between nulls, generally. However, it is not necessary to limit the magnitude of the luminescent spot as mentioned above actually. The relative dimension of a rod and a null is decided by the coding method used like the rod and the actual size of a null in order to express an alphabetic character. The number of alphabetic characters per [ which was displayed with the bar code notation ] inch is called a notation consistency.

**[0003]** A pencil of light rays is led to a target including the bar code notation attached on the surface of the article along an optical way with an optic. Scan components can also draw the scanning line which crosses a bar code notation, carries out the sweep of the luminescent spot and crosses a notation, can also scan the field of view of a photodetector, or can also perform the both. Moreover, the scanner is equipped with the photodetector. The photodetector has the field of view which protruded the bar code notation a little and was extended, and carries out the operation which detects the light of various strength reflected from the notation. A photodetector generates the electrical symbol showing a series of rods and nulls in a bar code notation. This electrical symbol is decoded to the data which a bar code notation expresses later. Although it is suitable especially as the light source of a scanner since a semiconductor device is small, it is cheap and there is little power consumption, using it for a certain kind of application has some faults. The 1st is that the life of a certain semiconductor laser, especially the semiconductor laser which gives off light in a visible-spectrum field is comparatively short. The reflector which forms the induced emission optical resonator is a film to which a reflection factor falls with time amount. If a reflection factor falls, since the useful output power of laser will also fall, the effectiveness of actuation of a scanner is restricted. Degradation of a reflector is proportional to the current added to diode so that it may explain later. Of course, if the current to add is small, the life of semiconductor laser will become long.

**[0004]** There are other degradation mechanisms other than gradual degradation. That is, they are (1) catastrophic degradation and generation of (2) dark line defects. In catastrophic degradation, the laser under high-power actuation receives eternal breakage by the impression and slot which were produced in the reflecting mirror. A dark line defect is

the network structure of the rearrangement which may be generated while using laser. Once it generates, a dark line defect grows for a short time rapidly, and may make threshold current density increase. That is [ another disadvantageous profit of a semiconductor laser activity is always lifting of the temperature related to ON ], the activity of a long period of operation will contract the life of semiconductor laser further. Another fault of the semiconductor laser by which current marketing is carried out is a low thing compared with the visibility of the bundle of rays to which the visibility comes for example, out of HeNe gas laser. The reason nil why visibility is low is because those wavelength (about 680 nanometers) is high. Before, there was no satisfactory solution which conquers disadvantageous profit of using visible semiconductor laser for the scanner which reads a bar code notation from this invention.

[0005]

[Problem(s) to be Solved by the Invention] The 1st object of this invention is offering the scan method and equipment which read coding signs, such as a bar code notation which can be used by both the low power mode and the high power mode, in order to lengthen the activity life of semiconductor laser. The 2nd object is offering the scan method and equipment which read the coding sign which can adjust simultaneously the scan angle and power output level of a pencil of light rays. The 3rd object is equipped with the processing circuit which judges whether spatial change of a different reflection factor with the reflected light of various strength able to direct a predetermined sign pattern is expressed. It is offering the scanner which reads a coding sign.

[0006]

[Means for Solving the Problem] If it states briefly, this invention will offer the scan method and equipment which detect the sign which has the part from which a reflection factor like a bar code notation differs as the 1st example. This invention is equipped with the optic arranged in an optical way so that the part which leads a bundle of rays to the target to correct a bundle of rays optically and to be located near the datum level almost vertical to an optical way along an optical way, and adjoins the light source which takes out a bundle of rays spatially [ datum level ] may be scanned. Further, this invention had the visual field, detected a part of light [ at least ] of various strength reflected from the target, and is equipped with the photodetector which carries out the operation which generates the electric signal showing the detected intensity of light. In order that the reflected light of still more various strength may judge whether spatial change (it is possible to direct existence of a predetermined sign pattern) of a different reflection factor is expressed, this invention is equipped with a means to generate an enable signal, and a means to correct a bundle of rays according to an enable signal when a processing means to process the electrical signal which the photodetector generated and to generate a test signal, and its test signal are larger than a predetermined reference signal. This invention is equipped with the light source which irradiates a target, the photodetector which receives a part of light [ at least ] reflected from the target, the decoder which decodes the reflected intensity of light and is made the expression of a coding sign, and the controller which operates the light source in the 1st mode of low power, and the 2nd high-power mode as the 2nd example, and offers the scanner and the approach of reading the coding sign on a target front face.

[0007] The new mode considered to be the description of invention is indicated in detail to the claim. About a scanner, the invention about the operation itself, and other objects and advantages, with reference to the accompanying drawing, if explanation of the following specific examples is read, he will fully be able to understand. The same components are displayed with the same reference number among drawing.

[0008]

[Example] the semiconductor laser scanner with which this invention generally reads the sign from which a reflection factor like a bar code notation differs -- more -- a detail -- the strength of a bundle of rays -- or the spatial range is adjusted automatically and it is related with suitable detection of the notation to read, a sweep, and (or) the scanner that performs a scan. Moreover, if the sign which may express or express a part of targets, such as a bar code notation, is detected, according to it, this invention will give a signal to the current driver and scan controller of the light source, and will offer the approach of operating a scanner. Drawing 1 and drawing 2 are the easy block diagrams of the example of the scanner which reads coding signs, such as a bar code notation, according to this invention, respectively. when it states in detail, the equipment identified with the reference number 10 is a desirable portable mold scanner which detects, scans and reads a bar code notation, and (or) analyzes. The typical bar code by which the current activity is carried out is Universal Product Code (UPC), EAN, and Codabar. And it is Code39. In the desirable example of this invention, the light source is semiconductor laser. As pointed out before, in order to be full power power or to operate a semiconductor laser scanner a long period of operation over long duration, there are many faults. The life of a part of visible semiconductor laser is [ 1st ] quite short. The reflector which forms an induced emission resonator is a comparison-film to which a reflection factor falls with time amount. If a reflection factor falls, since the useful output power of laser will also fall, the effectiveness on actuation of a scanner is restricted. However, if a current is added to semiconductor laser, degradation of a reflector will progress quickly. But, if the current to add is made below into a threshold, induced

emission of the semiconductor laser will not be carried out at all. In such the condition, semiconductor laser only emits light according to the process of spontaneous emission. However, if it is used in the state of low power, more than a threshold will be able to prolong the service life of semiconductor laser in 8 or more, even if it always assumes that it is an ON state 10 or more times of the service life of the semiconductor laser which operates by full power power, for example, 70,000 hours. Generally, since a scanner is not always actually used by the ON state more than quite many restrictions, in a actual activity, service life will be extended fairly.

[0009] It is that the semi-conductor laser diode of most which is used by the scanner today gives off light on the wavelength of 780 nanometers although the 2nd fault has the important concerns in laser in the comparatively short wavelength (680 nanometers) which is visible to human being's eyes under a fixed condition. To the wavelength of 780 nanometers, the sensibility of human being's eyes is quite low. Therefore, if such the light source is used, on a big scan square (for example, 15 degrees or more), the fault that a user cannot see the light reflected from the target in a typical operating distance will appear. Therefore, a user cannot check by his eye that the scan is performed on a notation. In order to conquer this constraint, it is the United States patent application 706,502nd. The activity of the beam of light for collimation indicated by the number is included. Although various approaches are proposed, those approaches have some which are missing especially in respect of structure desirable for a hand-held scanner, and the simplicity of an activity. Moreover, this invention relates to the scanner which started the scan of a target automatically and incorporated the stopping technique. The trigger is being used for some scanners in order to start the scan of a target as one description as indicated by U.S. Pat. No. 4,387,297. In many utilization, although the activity of a trigger is the important description, in a part of utilization, there is that it is also more desirable to start a scan using the another starting approach.

[0010] This invention offers the approach and equipment which operate the semiconductor laser of a scanner so that it is not necessary to use a trigger and in order to start a scan, and the high-power operating time of laser may be shortened as much as possible. Moreover, the strength of the reflected light is made into the maximum, and this invention offers the technique of adjusting the spatial scope of a bundle of rays, i.e., the sweep of a bundle of rays, so that a user may be seen, a sweep may fully be carried out and a notation can be read thoroughly. Drawing 1 shows the easy block diagram of the 1st example of the scanner which reads coding signs, such as a bar code notation, according to this invention. Shape can also be taken as a stock mold unit installed in a movable base, and a scanner 10 can also be included in the fixed equipment, for example, desk type equipment, and other equipments. The scanner 10 is equipped with the light source 11 which irradiates a target by the bundle of rays. The powerful light source chosen suitably is sufficient as the light source 11 so that the reflected light from a target may become as large as possible, or gas laser or semiconductor laser is sufficient as it. Moreover, the scanner 10 is equipped with the driver 12 who adjusts the strength of the pencil of light rays which comes out of the light source 11 according to the control signal from a controller 14.

[0011] Since the light source is semiconductor laser in the case of a desirable example, a driver 12 is a current driver and can usually adjust the optical output of laser by making the forward current which passes along the pn junction of laser increase. When the light source is not laser, in order to change the strength of an optical output, the suitable driver 12 suitable for the radiation property of the light source 11 is prepared. The scanner 10 is equipped with the scanner 13 which, in addition to this, leads the bundle of rays which comes out of the light source 11 to a target along an optical way. This invention can operate with the mode in which many differ, and a different configuration, and can lead a bundle of rays to a target. Since a coding sign also has the thing of only the element of the visual field from the light source 11, it is desirable to carry out a sweep over a large space field, i.e., to scan, so that a sweep may pass the whole coding sign certainly. Therefore, United States patent application 138,563rd It is desirable to scan by the pattern covering a two-dimensional field as indicated by the number. Moreover, in order to raise the dependability of read processing and to make possibility of an error into the minimum, it is desirable to adopt the scanner 13 repeated periodically so that a sign may not be read only once by one scan but it may read to multiple-times authenticity by repetitive scan. optical, electronic, or the scanner based on a mechanical method be independent -- those combination -- be -- it is contained in the range of this invention. These methods are not necessarily limited to the way of carrying out the sweep of the bundle of rays like the scanner indicated by the United States patent quoted before using a mirror.

[0012] Moreover, the scanner 10 is equipped with the photodetector 15 which generates the electric analog signal with which the light reflected from the bar code notation is detected, and detected various intensity of lights are expressed. Since the sweep of the bar code notation is carried out by the bundle of rays, the reflected light has various strength corresponding to the echo from the rod and null of a notation. The output from a photodetector 15 is applied to an amplifier / digitizer 16. As for the gain parameter of amplifier, deciding according to the distance to a target is desirable. The detector 17 connected to the amplifier / digitizer 16 carries out the operation which detects a certain pattern showing a part of bar code notation. The above-mentioned detector 17 is explained with reference to drawing 4 later. In one example of this invention, the output level of a photodetector 15 other than the control signal from a detector 17 can

adjust the gain characteristics of an amplifier. This invention is equipped with the amplifier 16 which has the gain characteristics which can be adjusted if it states in detail. It connects with a photodetector 15 and amplifier 16 carries out the operation which changes the comparatively weak electrical signal from a photodetector 15 into the amplified signal. After the amplified signal is digitized, in order to process further according to this invention, it is added to a detector 17. A detector 17 sends the feedback signal which controls the gain characteristics of an amplifier to an amplifier / digitizer 16. one example of this invention -- setting -- a detector 17 -- here -- "laser -- usable -- the output signal called" signal is generated. This signal shows that a part of bar code notation was detected. "laser -- usable -- in order that" signal may correct the optical output from the light source 11, may change a scan angle or may perform the both, it is sent to a controller 14. moreover, "laser -- usable --" signal can be used and the decoding circuit 18 which carries out the operation which decodes the signal received from the photodetector 15 can also be started. The started decoding circuit 18 carries out bias of the detector 17, and receives immediate data from an amplifier / digitizer 16. The data output edge 19 of the decoding circuit 18 can send out the decoded data which are used by the counter system from a scanner. moreover, "laser -- usable --" signal can be used as a feedback signal and the gain characteristics of an amplifier / digitizer 16 can also be controlled.

[0013] Drawing 2 is the easy block diagram of the 2nd example of the scanner by this invention. The light source 11, the current driver 12, a scanner 13, a photodetector 15, and the amplifier/digitizer 16 are the same as the thing explaining drawing 1, and is displayed with the same reference number. As for the example of drawing 1, having the controller 20 with which the structure of a system of the example of drawing 2 generates the laser enable signal 21 according to turning ON the light source 11 by the trigger 22 and the output of the detector circuit 17 differ a little. A trigger 22 is explained later. "the luminescent spot / scan mode is made to start. The laser enable signal 21 which the controller 20 generated is sent to both the current driver 12 and the scanner 13, in order to correct the optical output from the light source 11, in order to make a scan angle change, or in order to perform the both. If started by the output of a detector 17, or one of the triggers 22, a controller 20 will transmit the data which the photodetector 15 generated to the data output line 23, i.e., a connector. Like the example of drawing 1, an enable signal can also be used as a feedback signal which controls the gain characteristics of an amplifier / digitizer 16. drawing 3 (a) - drawing 3 (d) A series of actuation of one example of this invention when scanning a target including a bar code notation by the light source 11 is shown.

[0014] drawing 3 (a) - drawing 3 (d) Although it would come out, this invention performed count, i.e., analysis, about the electrical signal which sampled the light which is easily understood from easy explanation, and which was reflected from a part of target as one description, and was detected, and the detected part is equipped with the detector which can judge whether it means that the bar code notation was detected. The desirable example of this detector 17 is explained later. In order that the reflected light of various strength may judge whether spatial change (it is possible to direct predetermined existences of a sign pattern, such as a bar code notation) of a different reflection factor is expressed, the 1st technique by this invention processes an electrical signal, and generates a test signal. An enable signal will be generated if this test signal is over the predetermined reference signal. According to the enable signal, a bundle of rays is corrected in one or the way beyond it so that it may explain below. The 2nd technique by this invention processes an electrical signal, and generates the count of the number of transition between the sign part parts of the reflection factor from which it differs between predetermined time intervals. It judges whether this count is used and the reflected light of various strength expresses existence of predetermined sign patterns, such as a class of a general bar code notation and bar code notation or a special bar code notation. An enable signal will be generated if a count exceeds the predetermined minimum value. According to this enable signal, a bundle of rays is corrected similarly.

[0015] The 3rd technique by this invention calculates the ratio of the low die length for sign part of a reflection factor, and the die length for sign part of a high reflection factor by processing an electrical signal, in order that the reflected light of various strength may judge whether spatial change (it is possible to direct existence of a predetermined sign pattern) of a different reflection factor is expressed. An enable signal will be generated if the ratio is smaller than a predetermined value. According to this enable signal, a bundle of rays is corrected similarly. In order that the 4th technique by this invention may judge whether the reflected light of various strength expresses spatial change (it is possible to direct existence of a predetermined sign pattern) of almost same different reflection factor in each continuous scan, it processes an electrical signal and compares the signal by the 1st scan with the signal by the following scan of the 2nd. An enable signal will be generated if the comparison during each scan which a predetermined number follows is in agreement exactly. According to this enable signal, a bundle of rays is corrected similarly. Drawing 3 (a) Actuation of the scanner of this invention in the first phase of operation which does not exist in the scanning pattern of the bundle of rays which the coding sign irradiated is shown. Actuation of the scanner of this invention starts in the 2nd phase (drawing 3 (b)) of operation where a part of coding sign exists in a scanning pattern. That is, if a scanner is moved to a location with a coding sign, a part of coding sign will enter in the scanning pattern of the bundle of rays which came out

of the light source 11. A detector 17 detects a part of notation, generates a laser enable signal, and shifts actuation of a scanner to the 3rd phase of operation.

[0016] Drawing 3 (c) Actuation of the equipment of this invention in the 3rd phase of operation which exists in the scanning pattern of the bundle of rays which all coding signs irradiated is shown. The read coding sign is decoded and the decoded data are transmitted so that it may explain later. Drawing 3 (d) After a coding sign is read, actuation of the equipment of this invention in the 4th phase of operation which exists in the scanning pattern of the bundle of rays which a part of coding sign still irradiated is shown. Like a graphic display, at this time, as for a bundle of rays, width of face is narrowed, and that range is a part of coding sign. drawing 3 (a) - drawing 3 (d) This invention sampled the light reflected from a part of target as one description, count, i.e., analysis, was performed and the detected part is equipped with the detector which can judge whether it means that the bar code notation was detected so that I may be easily understood from easy explanation. It is used as a result of [ this ] count (i.e., an analysis result), and a scan angle is changed between the 2nd actuation phase and the 3rd actuation phase and between the 3rd actuation phase and the 4th actuation phase. That is, scan path length can be changed. In the 2nd example, the intensity of light, the luminescent-spot size in datum level, or a scan speed can correct another parameter of a bundle of rays.

[0017] If all coding signs are decoded, it is not necessary to maintain the scan angle 30 (or the intensity of light of a high level from the light source 11 or its both) any longer in the 3rd phase of operation. Therefore, the bundle of rays of the scanner after predetermined time amount passes is drawing 3 (d). It is returned to the almost same configuration as the 1st phase of operation so that it may be shown. In that case, a detector 17 will be made into a disable even if a part of notation is detecting. If actuation of the scanner by this invention is summarized, this invention sampled the light reflected from a part of target as the 1st description, count, i.e., analysis, was performed and the detected part is equipped with the detector which can judge whether it means that the bar code notation was detected. If it judges that the bar code notation was detected, in order to perform scan and decoding actuation thoroughly, some properties of a bundle of rays are corrected. The specific property that a bundle of rays should be corrected is decided by the design of a scanner, the application, and the mode of operation. Before moving to more detailed explanation of the example of this invention, it will be necessary to discuss the description on the design of the laser scanner which has fixed effect on somatization of this invention. There are various technical properties which should be taken into consideration in the design of a laser scanner, in a scan process, it adjusts using the principle of this invention, and the parts (property of a bundle of rays etc.) can be corrected. Examination of such a technical property is for clarifying possibility of not limiting the range of this invention and applying the technical property of this invention to a laser design factor or specific user special; consideration. After explaining such a technical property, the specific property on activities, such as scan mode, is explained.

[0018] The technical property examined here is the brightness (effective power output), a regulation matter and specification, and the technical performance property (for example, the life of laser, design cost, manufacture possibility, and the similar description) of a laser beam. The brightness of the laser beam reflected from the target front face is the most important parameter in the design of a laser scanner, especially a hand-held laser scanner. A user turns a laser beam to a bar code, and a hand-held laser scanner doubles collimation. It is important that can fully check by looking the bundle of rays to which a user is the basis of the brightness of various perimeters and came out of laser, and collimation doubles, and for actuation to be easy. The brightness of a laser beam is the function of the parameter of a large number which contain the scan path length in which a bundle of rays carries out a sweep in the wavelength (an eye is sensed more sensitive the more to a reflected ray the more especially the wavelength of a red field becomes short, since human being's eyes have the sensibility which changes with wavelength) of a laser beam, luminescent-spot size, a power output, and scan mode. The wavelength of laser diode is comparatively fixed, and since luminescent-spot size is decided by resolution, generally the parameter which an architect can change is only two, a power output and scan die length. About a fixed application, one of these two parameters or both are changeable. A parameter can also be changed periodically working, or a user can do a trigger and can also change it. For example, in scan mode, only when having doubled collimation of a scanner using the time of the user searching for the target, or the bundle of rays, brightness of (this mode of operation is called "collimation" mode) and a laser beam can be made into max.

[0019] Another technical property about a laser scanner is control criteria and specification. Such control criteria have many things related to the magnitude of the power emitted from laser over long duration. For example, U.S. CDRH (the abbreviation for Center for Devices and Radiological Health) has classified laser equipment into four classes (Class I - class IV). The laser of Class I takes out a maximum of 0.39-microwatt radiant power between the time amount for 10,000 seconds or more. This laser is very low power and there is almost no risk in respect of health, i.e., safety. The laser of Class II is 1,000. A maximum of 3.9-microwatt radiant power is taken out between the time amount more than a second. the laser of Class II should avoid "exposure with the language of "caution", and the easy caution label to which



the "starburst notation" was attached - laser light comes out from this hole -- " -- it is necessary to attach the aperture label with which the phrase was indicated The phrase which described the language, "don't gaze at laser light", a "class II laser product" and a laser medium, and output power of "caution", and a "starburst notation" are included in the warning logotype of Class II. This invention is useful to meeting the control criteria about radiation of a laser beam certainly. Since the laser by this invention takes out a high-power bundle of rays to comparatively short time amount, in spite of being in control criteria, on datum level, the luminescent spot bright enough which a user can check by looking can be generated, and a user can double collimation of a laser scanner using this luminescent spot. An architect can make the visibility of a laser beam the optimal, selecting appropriately the parameter of the power output of a laser scanner, luminescent-spot size, a scan angle, a scan speed, and others, and meeting the control criteria over the laser of the corresponding class according to constraint of the corresponding regulation.

[0020] Moreover, it can be made to operate in scan mode which is different in a laser scanner using many descriptions of this invention. About the hand-held laser scanner by this invention, there are three possible scan modes, i.e., the luminescent spot / scan mode by the scan mode by the usual trigger and (a) (b) trigger, and (c) target detection scan mode. In the case of the scan mode (a) by the usual trigger, the laser beam is usually off. In this scan mode, a trigger is used and the high-speed iteration scan of a bar code notation is started. having performed the scan about one target many times, in order to have performed right actuation -- or it is necessary to distinguish whether the scan was performed once about two or more targets In order to perform decoding well, the capacity to detect each target which should be scanned in order is indispensable. As everyone knows, in order to repeat a bar code notation many times and to carry out a sweep, in the case of the conventional scanner (for example, equipment given in U.S. Pat. No. 4,387,297), a trigger is pulled, and it operates a scan means each time. The hand-pushed switch of a trigger attached near the joint of the barrel section of housing and a pedicel is desirable. The switch of a trigger is arranged at the pedicel so that a switch can be pushed by the index finger. The sweep of the bar code notation is carried out many times until a scan means reaches a perfect decoder or a perfect time-out, whenever a switch is pushed.

[0021] In the scan mode (a) by the trigger, if a decoding network decodes a bar code notation with the sufficient result, a decoding signal can be generated and the directions means installed in the scanner can be operated. A directions means is the alarm which makes PITSU and a sound, light emitting diode, or its both. If an alarm sounds, if light emitting diode lights up, or if the both operate, a user will get to know that the scan of the specific notation was completed. In the luminescent spot / scan mode by the trigger (b), if a trigger is pulled, a bundle of rays will come out at a narrow include angle. In this scan mode, the short line whose very bright die length is about 1 inch is formed with the beam of light of the narrow scan angle of laser. Looking at by the eye actually, the user who had a laser scanner in the hand can attach an aim using this bright short line, and can turn a bundle of rays to a location with a bar code notation. After the sign pattern showing a bar code notation is detected, a bundle of rays is expanded so that the sweep of the whole notation may be carried out and it can be decoded. Consequently, decoding is performed, although a reflected ray cannot become gloomy and a user cannot see. Although it is not necessarily required, only when a bright line is on a notation, as for a scanner, it is desirable to detect (it is not on the text or a graph) and a bar code.

[0022] In target detection scan mode (c), there is no trigger in a scanner, and the laser beam of ON is a narrow include angle, and has always come out of the scanner by low power. If the sign pattern showing a bar code notation is detected, in order to read the whole notation, the scan angle of a bundle of rays can extend and power is increased. Any one or all of the above-mentioned modes of operation (a), (b), and (c) is employable as one scanner using the bar code notation detecting method by this invention. The above-mentioned mode of operation may dedication-ize a laser scanner so that a user can also select manually (operating a switch) or it may operate by the specific mode of operation. Moreover, a user can also select a different laser beam output and a different scan parameter (in the strength of a beam of light, it is a scan angle etc.) manually (operating a switch), or in the scanner of a specific format, they can be determined automatically and can also be dedication-ized. Moreover, determining the scan parameter of a specific format automatically is also considered by analyzing the detected bar code notation. Moreover, the scan mode which was most suitable for detecting the whole bar code notation most effectively and appropriately can be determined using a calculating-machine algorithm. All of these alternative examples are contained in the range of this invention.

[0023] Drawing 4 is the schematic drawing of the desirable example of the detector 17 by this invention. The signal from an amplifier / digitizer 16 is added to the input edge of an inverter 31, and the output of an inverter 31 is applied to diode 32. The 1st resistor R1 A capacitor 34 forms an RC circuit and is a resistor R1. It connects with the serial between the outgoing end of diode 32, and the 1st input edge 35 of the release collector output comparator 37. The capacitor 34 is connected with the 1st input edge 35 between touch-down potentials. The 2nd resistor R2 It connects with the 1st input edge 35 between touch-down potentials. Resistor R1 As for resistance, it is desirable that it is quite smaller than the resistance of a resistor R2. The 2nd input edge 38 of a comparator is the resistor R4 connected to the serial between

potential V and touch-down. R5 It connects with the node of the constituted potentiometer. the outgoing end 41 of a comparator 37 -- "laser -- usable --" signal line and resistor R3 It connects with the feed back line along which it passes. Resistor R3 Since other terminals are connected to the 2nd input edge 38 of a comparator 37, the feedback from the outgoing end of a comparator 37 gives the hysteresis effectiveness to actuation of a comparator. The actuation of a detector 17 is as follows. namely, -- if a digitizer outputs a rod -- R2 R1 since it is quite large -- a capacitor -- about -- it stores electricity with the time constant of R1 C. When a digitizer outputs a null, 32 is diode R1. Since the discharge along which it passes is barred, a capacitor is R2. It leads and discharges. Time constant R2 C is made quite larger than time constant R1 C so that much null time amount may be required to cancel the effectiveness of a rod. The electrical potential difference more than the threshold set up by the activity of a comparator 37 appears in a capacitor 34 after some rods of a typical consistency, and the scan of a null. At this event, in order to direct existence of a bar code, a "trigger" signal, i.e., a laser enable signal, is outputted from a comparator 37.

[0024] At this event, the release collector output of a comparator 37 is driven to a low value, and lowers the threshold of a comparator so that the small electrical-potential-difference change on the capacitor 34 produced by a rod, a next null, and a next quiescence area may not make a trigger signal a disable. The trigger of the circuit will be similarly carried out, as stated above, though the long black rod might be scanned. However, the digitizer is equipped with the circuit which identifies the read of a long black rod in the desirable example. That is, a digitizer functions as a high-pass filter. Even if a long black rod is scanned, a time-out will be used for the above-mentioned digitizer circuit so that only a short panel may be made. If this short pulse signal is added to a detector 17, a threshold is not exceeded and the "trigger" signal will not be outputted. A trigger signal is canceled after all after the considerable long time amount in which the digitized rod does not exist. If a scanner is kept away from a bar code notation, it directs not to scan the notation with the already same trigger signal of which a capacitor discharges through R2 C and a laser enable signal is canceled to a DIKODINGU logical circuit or a detector.

[0025] It is one of the important descriptions of this invention that the bar code detector shown in drawing 4 is sensitive to a specific image pattern. A detector answers a powerful reflected light signal and a weak reflected light signal, and a capacitor 34 is charged or it discharges. If a fixed threshold is reached, a net charge will be used in order to generate a trigger signal. Drawing 6 (a) It is the enlarged drawing of a rod and the pattern of a null which exists in a typical notation. Drawing 6 (b) Drawing 6 (a) When a notation is scanned from the left to the right, it is the graph which showed the electrical potential difference on a line (the 1st input edge of a comparator) 35 as a function of time amount. When it states in detail and a rod 50 is scanned, it turns out that an electrical potential difference increases somewhat linearly so that it may see in Period a. When a null is scanned, it is a resistor R1 like Period b. The charge which it leads, and a charge is not added to Capacitor C, but exists in Capacitor C is a resistor R2. It leads and discharges slowly. When it meets with the following rod 51 in Period c, an electrical potential difference is impressed again and it is a resistor R1. It leads and Capacitor C is charged. When it meets with the following null in Period d while a trigger signal scans, it is a resistor R1. The charge which it leads, and a charge is not added to Capacitor C, but exists in Capacitor C is a resistor R2 similarly. It leads and discharges slowly. When it meets with the following double-width rod 53 in Period e during a scan, an electrical potential difference is impressed similarly and it is a resistor R1. It leads and Capacitor C is charged. drawing 6 (b) from -- it understands -- as -- Period e -- setting -- the full voltage on a line 35 -- threshold electrical potential difference  $V_t$  It has exceeded. Full voltage is the threshold electrical potential difference  $V_t$ . When exceeded, it is drawing 6 (c). When a trigger signal moves from a high price to a low value, a trigger enable signal is started so that it may be shown. The electrical potential difference on a line 35 continues increasing in the period e when a rod 53 is scanned. It sets at the period f when the null is scanned, and is a resistor R1. The charge which it leads, and a charge is not impressed to Capacitor C, but exists in Capacitor C is a resistor R2. It leads and discharges slowly. When it meets with the following rod 54 in Period g, it is a resistor R1 similarly. It lets it pass, an electrical potential difference is impressed, and a capacitor is charged.

[0026] In the example of this invention, the circuit which turns ON laser at the shape of a pulse can be prepared between the time amount long enough thoroughly scanned once from the edge of a visual field to an edge. Next, a circuit turns OFF laser between fixed time amount, before repeating a cycle. The laser usable output of the circuit of drawing 4 is latched in the end of the period whose laser is ON. Latch's output is used within a scanner as a laser usable output. Since it does not change until the following laser "on" period finishes latch's output, the effect of what does not exert discharge of the capacitor C in a laser "off" period on latch's output, either. A parameter R1, R2, and C should be appropriately selected so that the electrical potential difference which joins Capacitor C may reach in 1 scan time at a steady state. In Period g, the electrical potential difference concerning Capacitor C reaches the steady-state value near the maximum of  $V(1 - \exp(-t/R1C))$ , i.e., V. An electrical potential difference takes the value near V until a bar code already disappears from the visual field of a photodetector 15. If a bar code disappears, as the period h of drawing 4 shows, a capacitor will

discharge. The laser enable signal added to a controller 14 or 20 can be used for detecting the pattern of a specific spatial change through the suitable hardware or the software formed in a controller 14 or 20. For example, a controller 14 or 20 can be equipped with the suitable logical circuit which counts the number of transition between the sign part parts from which the reflection factor in a predetermined period differs by choosing the parameter of a detector 17 appropriately. This count is used for judging whether the light reflected from a part for the sign part of a different reflection factor expresses predetermined existences of a sign pattern, such as a general bar code notation. Moreover, since it judges whether a controller 14 or 20 expresses spatial change (it is possible to express existence of a predetermined sign pattern) of the reflection factor from which the reflected light of various strength differs, the ratio of the die length for sign part of a high reflection factor and the die length for sign part of a low reflection factor is calculated, and an enable signal can be generated if the ratio is smaller than a predetermined value.

[0027] The reflected light of various strength in each continuous scan a controller 14 or 20 as another utilization In order to judge whether spatial change (it is possible to express existence of a predetermined sign pattern) of almost same different reflection factor is expressed, The signal from the 1st scan is compared with the signal from the 2nd subsequent scan, and an enable signal can be generated if the comparison during each scan which a predetermined number follows is in agreement exactly. Drawing 5 is the actuation current Id about the source mode output of the semiconductor laser used as the light source. It is the graph with which it expressed as a function. If it explains in detail, it is a transition point It. The threshold current point of laser is shown. If the laser diode current is increased, the power output by spontaneous emission will increase comparatively slowly. If it passes over a threshold current point, since laser oscillation will start, an output increases rapidly. According to this invention, it is two operating current points I1 and I2. It exists. As for both, it is desirable that it is in a laser oscillation field. Moreover, I1 It is possible to also make it operate at a current point which is in a spontaneous emission field.

[0028]

[Function] Next, actuation of this invention in target detection scan mode is explained. (Since the actuation in other modes of operation is also alike, detailed explanation is omitted.) The light source 11 is the actuation current I1. Operating by the 1st mode of operation of corresponding low power, a scanner 13 is drawing 3 (a). As shown, it acts on a comparatively narrow scan square between the 1st mode of operation. In the 1st mode of operation, although output power is small, since the light reflected from a target is made for the beam-of-light image produced on the narrow scan square to appear as a bright short line which is visible to a user, a user can use the light as a beam of light for collimation, and can turn to the notation which decodes a scanner. Next, a detector 17 is drawing 3 (b). If it judges that a part of notation occurs in the visual field of a scanning pattern so that it may be shown, a scanner will change to the 2nd mode of operation. At the 2nd mode of operation, the light source 11 is the actuation current I2. Operating by corresponding high power, a scan angle is drawing 3 (c). It can extend to the shown include angle. Since a scan angle is fairly large, probably a user will not catch sight of the beam-of-light image on a target. However, in the 2nd mode of operation, since only a short time operates, even if the beam-of-light image on a target does not appear as for a scanner, it is not so inconvenient.

[0029] The scanner after decoding was performed is drawing 3 (d). It is returned to the 1st mode of operation so that it may be shown. Directing that a notation is scanning a detector 17 is continued. It required that a control circuit should be left to the laser enable signal between periods until it starts a cycle again in order to prevent the duplication read of the same notation, when it is in target detection scan mode, and has the logical circuit required as appearing in order to extend a scan angle again. A user comes to catch sight of a beam-of-light image again. If a bar code is not read between short time amount (for example, 1 - 10 seconds), since semiconductor laser is considered not to unite the focus with an appropriate bar code notation, a scanner returns to the 1st mode of operation automatically so that a user can set a scanner by the bar code notation for collimation again. In one example of this invention, a scanner can distinguish a bar code notation and regular patterns of a light region and a dark field formed with the printer graphic, such as a pattern. In almost all activities, since, as for the article scanned, most quantity of the phrase other than one bar code notation is indicated in the form of a printer graphic on the whole front face, especially this description is important. One of the important advantages of this invention is that a scanner disregards all phrases and is made usable only with a actual bar code notation.

[0030]

[Effect of the Invention] Although the bar code of a straight line, i.e., single track, was explained, this invention is not limited to the above-mentioned example, and can be used also for 2-dimensional bar codes, such as Code49 and similar sign NOT-AND operation notation. Moreover, it is thought that the scan method of this invention can be used also for various kinds of machine vision equipment, i.e., optical-character-recognition equipment, which acquires information from the description of the front face of the article to scan from the sign of another formats, such as an alphabetic

character. In all the indicated examples, the element of a scanner can be built into a very compact package, and a scanner can be manufactured as a single printed circuit board, i.e., an integral-construction module. Such an integral-construction module can be used as an exchangeable laser scan element in a variety of data collectors. For example, an integral-construction module can be used for a hand-held scanner and the desk type scanner attached or installed in the table top bottom as a subassembly of a more complicated data collector or it attached in the flexible arm extended throughout a table front face. As for an integral-construction module, it is desirable to constitute from scan elements, such as laser / optical article subassembly attached in the base material, a revolution mirror, or a reciprocation mirror, and components of photodetection equipment. The control line combined with these components and a data line are connectable with the electrical connector attached in a modular outside surface or a modular edge so that a module can be electrically connected to the connector of the other party combined with another component of a data collector.

[0031] Each integral-construction module can combine specific scan characteristics -- that it can be used in a fixed activity distance, or it can be used about a fixed notation consistency. Moreover, a scan characteristic can also be defined by the manual setting of the actuation switch combined with the integral-construction module. Moreover, a user can also fit a data collector so that the article of a different class may be scanned, or can exchange the integral-construction module of a data collector using an easy electrical connector, and can also fit a data collector to various applications. The scan module explained above contains one piece or more than it for component parts, such as a keyboard, a display, data storage, utilization software, and a database. Shape can also be taken in a self-warehouse type data collector. such a data collector -- a modem or an ISDN interface -- leading -- or the low power radio broadcasting from a portable terminal unit to a quiescence receiver -- a data collector and another component part of a local area network -- or a communication interface can also be equipped so that it can communicate with a telephone-exchange network. It will be understood that the combination of each description described above or two descriptions or more can be beneficially used in the different scanner and different bar code reader of a format from the format described above.

[0032] Although the case where this invention was materialized to the scanner which can adjust an optical output, a scan angle, or its both was explained, since various corrections are performed and a change on structure can be made within the limits of the pneuma of this invention, this invention is not limited to the indicated constructional detail. Even if it does not discuss any more, by the above explanation, since the summary of this invention will be completely clear, it is seen from the conventional technique, and without omitting the description which constitutes the essence of the specific mode of this invention clearly, this invention can be united with various applications and can be corrected easily. Therefore, such a correction object should be contained in the thing and the equal range which a claim means.

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**TECHNICAL FIELD**

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[Industrial Application] Generally, the semi-conductor light source is used for this invention, more, in a detail, the strength or spatial range of a bundle of rays is adjusted, and it relates to the laser scanner which reads the sign from which reflection factors, such as a bar code notation, differ, and the scanner which performs detection and read of a sign.

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 PRIOR ART
 

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[Description of the Prior Art] Various kinds of laser scanners for reading a bar code notation are known for this field. The bar code notation which carried out digital display of the information which identifies the description of the article or others is attached to the front face or label of an article. The bar code notation itself is the coded sign pattern which consists of a series of rod notations of various width of face which touched the null and boundary of various width of face, set spacing mutually, and has been arranged. U.S. Pat. No. 4,251,798 -- said -- the 4,360,798th a number -- said -- the 4,369,361st a number -- said -- the 4,387,297th a number -- said -- the 4,593,186th a number -- said -- the 4,496,831st a number -- said -- the 4,409,470th a number -- said -- the 4,460,120th a number -- said -- the 4,607,156th a number -- said -- the 4,673,803rd The scanner of various configurations is indicated by the number. Generally, these scanners are designed so that the bar code notation of a Universal Product Code (UPC) method may be read, and they are used for them for a fixed distance, i.e., read distance, in the location where the stock was location [ the stock ] or fixed, setting from a bar code notation. Generally, the scanner is equipped with the light sources, such as laser which takes out a bundle of rays, or a semiconductor device. A bundle of rays is optically corrected so that the luminescent spot of fixed magnitude may be formed. As for the magnitude of the luminescent spot, it is desirable to make it the same as the minimum width of face between the fields of a different reflection factor, i.e., the rod of a bar code notation and the minimum width of face between nulls, generally. However, it is not necessary to limit the magnitude of the luminescent spot as mentioned above actually. The relative dimension of a rod and a null is decided by the coding method used like the rod and the actual size of a null in order to express an alphabetic character. The number of alphabetic characters per [ which was displayed with the bar code notation ] inch is called a notation consistency.

[0003] A pencil of light rays is led to a target including the bar code notation attached on the surface of the article along an optical way with an optic. Scan components can also draw the scanning line which crosses a bar code notation, carries out the sweep of the luminescent spot and crosses a notation, can also scan the field of view of a photodetector, or can also perform the both. Moreover, the scanner is equipped with the photodetector. The photodetector has the field of view which protruded the bar code notation a little and was extended, and carries out the operation which detects the light of various strength reflected from the notation. A photodetector generates the electrical symbol showing a series of rods and nulls in a bar code notation. This electrical symbol is decoded to the data which a bar code notation expresses later. Although it is suitable especially as the light source of a scanner since a semiconductor device is small, it is cheap and there is little power consumption, using it for a certain kind of application has some faults. The 1st is that the life of a certain semiconductor laser, especially the semiconductor laser which gives off light in a visible-spectrum field is comparatively short. The reflector which forms the induced emission optical resonator is a film to which a reflection factor falls with time amount. If a reflection factor falls, since the useful output power of laser will also fall, the effectiveness of actuation of a scanner is restricted. Degradation of a reflector is proportional to the current added to diode so that it may explain later. Of course, if the current to add is small, the life of semiconductor laser will become long.

[0004] There are other degradation mechanisms other than gradual degradation. That is, they are (1) catastrophic degradation and generation of (2) dark line defects. In catastrophic degradation, the laser under high-power actuation receives eternal breakage by the impression and slot which were produced in the reflecting mirror. A dark line defect is the network structure of the rearrangement which may be generated while using laser. Once it generates, a dark line defect grows for a short time rapidly, and may make threshold current density increase. That is [ another disadvantageous profit of a semiconductor laser activity is always lifting of the temperature related to ON ], the activity of a long period of operation will contract the life of semiconductor laser further. Another fault of the semiconductor laser by which current marketing is carried out is a low thing compared with the visibility of the bundle of rays to which the visibility comes for example, out of HeNe gas laser. The reason nil why visibility is low is because those wavelength (about 680

nanometers) is high. Before, there was no satisfactory solution which conquers disadvantageous profit of using visible semiconductor laser for the scanner which reads a bar code notation from this invention.

[0005]

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**EFFECT OF THE INVENTION**

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[Effect of the Invention] Although the bar code of a straight line, i.e., single track, was explained, this invention is not limited to the above-mentioned example, and can be used also for 2-dimensional bar codes, such as Code49 and similar sign NOT-AND operation notation. Moreover, it is thought that the scan method of this invention can be used also for various kinds of machine vision equipment, i.e., optical-character-recognition equipment, which acquires information from the description of the front face of the article to scan from the sign of another formats, such as an alphabetic character. In all the indicated examples, the element of a scanner can be built into a very compact package, and a scanner can be manufactured as a single printed circuit board, i.e., an integral-construction module. Such an integral-construction module can be used as an exchangeable laser scan element in a variety of data collectors. For example, an integral-construction module can be used for a hand-held scanner and the desk type scanner attached or installed in the table top bottom as a subassembly of a more complicated data collector or it attached in the flexible arm extended throughout a table front face. As for an integral-construction module, it is desirable to constitute from scan elements, such as laser / optical article subassembly attached in the base material, a revolution mirror, or a reciprocation mirror, and components of photodetection equipment. The control line combined with these components and a data line are connectable with the electrical connector attached in a modular outside surface or a modular edge so that a module can be electrically connected to the connector of the other party combined with another component of a data collector.

[0031] Each integral-construction module can combine specific scan characteristics -- that it can be used in a fixed activity distance, or it can be used about a fixed notation consistency. Moreover, a scan characteristic can also be defined by the manual setting of the actuation switch combined with the integral-construction module. Moreover, a user can also fit a data collector so that the article of a different class may be scanned, or can exchange the integral-construction module of a data collector using an easy electrical connector, and can also fit a data collector to various applications. The scan module explained above contains one piece or more than it for component parts, such as a keyboard, a display, data storage, utilization software, and a database. Shape can also be taken in a self-warehouse type data collector. such a data collector -- a modem or an ISDN interface -- leading -- or the low power radio broadcasting from a portable terminal unit to a quiescence receiver -- a data collector and another component part of a local area network -- or a communication interface can also be equipped so that it can communicate with a telephone-exchange network. It will be understood that the combination of each description described above or two descriptions or more can be beneficially used in the different scanner and different bar code reader of a format from the format described above.

[0032] Although the case where this invention was materialized to the scanner which can adjust an optical output, a scan angle, or its both was explained, since various corrections are performed and a change on structure can be made within the limits of the pneuma of this invention, this invention is not limited to the indicated constructional detail. Even if it does not discuss any more, by the above explanation, since the summary of this invention will be completely clear, it is seen from the conventional technique, and without omitting the description which constitutes the essence of the specific mode of this invention clearly, this invention can be united with various applications and can be corrected easily. Therefore, such a correction object should be contained in the thing and the equal range which a claim means.

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**TECHNICAL PROBLEM**

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[Problem(s) to be Solved by the Invention] The 1st object of this invention is offering the scan method and equipment which read coding signs, such as a bar code notation which can be used by both the low power mode and the high power mode, in order to lengthen the activity life of semiconductor laser. The 2nd object is offering the scan method and equipment which read the coding sign which can adjust simultaneously the scan angle and power output level of a pencil of light rays. The 3rd object is equipped with the processing circuit which judges whether spatial change of a different reflection factor with the reflected light of various strength able to direct a predetermined sign pattern is expressed. It is offering the scanner which reads a coding sign.

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**MEANS**

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[Means for Solving the Problem] If it states briefly, this invention will offer the scan method and equipment which detect the sign which has the part from which a reflection factor like a bar code notation differs as the 1st example. This invention is equipped with the optic arranged in an optical way so that the part which leads a bundle of rays to the target to correct a bundle of rays optically and to be located near the datum level almost vertical to an optical way along an optical way, and adjoins the light source which takes out a bundle of rays spatially [ datum level ] may be scanned. Further, this invention had the visual field, detected a part of light [ at least ] of various strength reflected from the target, and is equipped with the photodetector which carries out the operation which generates the electric signal showing the detected intensity of light. In order that the reflected light of still more various strength may judge whether spatial change (it is possible to direct existence of a predetermined sign pattern) of a different reflection factor is expressed, this invention is equipped with a means to generate an enable signal, and a means to correct a bundle of rays according to an enable signal when a processing means to process the electrical signal which the photodetector generated and to generate a test signal, and its test signal are larger than a predetermined reference signal. This invention is equipped with the light source which irradiates a target, the photodetector which receives a part of light [ at least ] reflected from the target, the decoder which decodes the reflected intensity of light and is made the expression of a coding sign, and the controller which operates the light source in the 1st mode of low power, and the 2nd high-power mode as the 2nd example, and offers the scanner and the approach of reading the coding sign on a target front face.

[0007] The new mode considered to be the description of invention is indicated in detail to the claim. About a scanner, the invention about the operation itself, and other objects and advantages, with reference to the accompanying drawing, if explanation of the following specific examples is read, he will fully be able to understand. The same components are displayed with the same reference number among drawing.

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## OPERATION

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[Function] Next, actuation of this invention in target detection scan mode is explained. (Since the actuation in other modes of operation is also alike, detailed explanation is omitted.) The light source 11 is the actuation current I1. Operating by the 1st mode of operation of corresponding low power, a scanner 13 is drawing 3 (a). As shown, it acts on a comparatively narrow scan square between the 1st mode of operation. In the 1st mode of operation, although output power is small, since the light reflected from a target is made for the beam-of-light image produced on the narrow scan square to appear as a bright short line which is visible to a user, a user can use the light as a beam of light for collimation, and can turn to the notation which decodes a scanner. Next, a detector 17 is drawing 3 (b). If it judges that a part of notation occurs in the visual field of a scanning pattern so that it may be shown, a scanner will change to the 2nd mode of operation. At the 2nd mode of operation, the light source 11 is the actuation current I2. Operating by corresponding high power, a scan angle is drawing 3 (c). It can extend to the shown include angle. Since a scan angle is fairly large, probably a user will not catch sight of the beam-of-light image on a target. However, in the 2nd mode of operation, since only a short time operates, even if the beam-of-light image on a target does not appear as for a scanner, it is not so inconvenient.

[0029] The scanner after decoding was performed is drawing 3 (d). It is returned to the 1st mode of operation so that it may be shown. Directing that a notation is scanning a detector 17 is continued. It required that a control circuit should be left to the laser enable signal between periods until it starts a cycle again in order to prevent the duplication read of the same notation, when it is in target detection scan mode, and has the logical circuit required as appearing in order to extend a scan angle again. A user comes to catch sight of a beam-of-light image again. If a bar code is not read between short time amount (for example, 1 - 10 seconds), since semiconductor laser is considered not to unite the focus with an appropriate bar code notation, a scanner returns to the 1st mode of operation automatically so that a user can set a scanner by the bar code notation for collimation again. In one example of this invention, a scanner can distinguish a bar code notation and regular patterns of a light region and a dark field formed with the printer graphic, such as a pattern. In almost all activities, since, as for the article scanned, most quantity of the phrase other than one bar code notation is indicated in the form of a printer graphic on the whole front face, especially this description is important. One of the important advantages of this invention is that a scanner disregards all phrases and is made usable only with a actual bar code notation.

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[Translation done.]

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## EXAMPLE

[Example] the semiconductor laser scanner with which this invention generally reads the sign from which a reflection factor like a bar code notation differs -- more -- a detail -- the strength of a bundle of rays -- or the spatial range is adjusted automatically and it is related with suitable detection of the notation to read, a sweep, and (or) the scanner that performs a scan. Moreover, if the sign which may express or express a part of targets, such as a bar code notation, is detected, according to it, this invention will give a signal to the current driver and scan controller of the light source, and will offer the approach of operating a scanner. Drawing 1 and drawing 2 are the easy block diagrams of the example of the scanner which reads coding signs, such as a bar code notation, according to this invention, respectively. when it states in detail, the equipment identified with the reference number 10 is a desirable portable mold scanner which detects, scans and reads a bar code notation, and (or) analyzes. The typical bar code by which the current activity is carried out is Universal Product Code (UPC), EAN, and Codabar. And it is Code39. In the desirable example of this invention, the light source is semiconductor laser. As pointed out before, in order to be full power power or to operate a semiconductor laser scanner a long period of operation over long duration, there are many faults. The life of a part of visible semiconductor laser is [ 1st ] quite short. The reflector which forms an induced emission resonator is a comparison-film to which a reflection factor falls with time amount. If a reflection factor falls, since the useful output power of laser will also fall, the effectiveness on actuation of a scanner is restricted. However, if a current is added to semiconductor laser, degradation of a reflector will progress quickly. But, if the current to add is made below into a threshold, induced emission of the semiconductor laser will not be carried out at all. In such the condition, semiconductor laser only emits light according to the process of spontaneous emission. However, if it is used in the state of low power, more than a threshold will be able to prolong the service life of semiconductor laser in 8 or more, even if it always assumes that it is an ON state 10 or more times of the service life of the semiconductor laser which operates by full power power, for example, 70,000 hours. Generally, since a scanner is not always actually used by the ON state more than quite many restrictions, in a actual activity, service life will be extended fairly.

[0009] It is that the semi-conductor laser diode of most which is used by the scanner today gives off light on the wavelength of 780 nanometers although the 2nd fault has the important concerns in laser in the comparatively short wavelength (680 nanometers) which is visible to human being's eyes under a fixed condition. To the wavelength of 780 nanometers, the sensibility of human being's eyes is quite low. Therefore, if such the light source is used, on a big scan square (for example, 15 degrees or more), the fault that a user cannot see the light reflected from the target in a typical operating distance will appear. Therefore, a user cannot check by his eye that the scan is performed on a notation. In order to conquer this constraint, it is the United States patent application 706,502nd. The activity of the beam of light for collimation indicated by the number is included. Although various approaches are proposed, those approaches have some which are missing especially in respect of structure desirable for a hand-held scanner, and the simplicity of an activity. Moreover, this invention relates to the scanner which started the scan of a target automatically and incorporated the stopping technique. The trigger is being used for some scanners in order to start the scan of a target as one description as indicated by U.S. Pat. No. 4,387,297. In many utilization, although the activity of a trigger is the important description, in a part of utilization, there is that it is also more desirable to start a scan using the another starting approach.

[0010] This invention offers the approach and equipment which operate the semiconductor laser of a scanner so that it is not necessary to use a trigger and in order to start a scan, and the high-power operating time of laser may be shortened as much as possible. Moreover, the strength of the reflected light is made into the maximum, and this invention offers the technique of adjusting the spatial scope of a bundle of rays, i.e., the sweep of a bundle of rays, so that a user may be seen, a sweep may fully be carried out and a notation can be read thoroughly. Drawing 1 shows the easy block diagram of the 1st example of the scanner which reads coding signs, such as a bar code notation, according to this invention. Shape can also be taken as a stock mold unit installed in a movable base, and a scanner 10 can also be included in the

fixed equipment, for example, desk type equipment, and other equipments. The scanner 10 is equipped with the light source 11 which irradiates a target by the bundle of rays. The powerful light source chosen suitably is sufficient as the light source 11 so that the reflected light from a target may become as large as possible, or gas laser or semiconductor laser is sufficient as it. Moreover, the scanner 10 is equipped with the driver 12 who adjusts the strength of the pencil of light rays which comes out of the light source 11 according to the control signal from a controller 14.

[0011] Since the light source is semiconductor laser in the case of a desirable example, a driver 12 is a current driver and can usually adjust the optical output of laser by making the forward current which passes along the pn junction of laser increase. When the light source is not laser, in order to change the strength of an optical output, the suitable driver 12 suitable for the radiation property of the light source 11 is prepared. The scanner 10 is equipped with the scanner 13 which, in addition to this, leads the bundle of rays which comes out of the light source 11 to a target along an optical way. This invention can operate with the mode in which many differ, and a different configuration, and can lead a bundle of rays to a target. Since a coding sign also has the thing of only the element of the visual field from the light source 11, it is desirable to carry out a sweep over a large space field, i.e., to scan, so that a sweep may pass the whole coding sign certainly. Therefore, United States patent application 138,563rd It is desirable to scan by the pattern covering a two-dimensional field as indicated by the number. Moreover, in order to raise the dependability of read processing and to make possibility of an error into the minimum, it is desirable to adopt the scanner 13 repeated periodically so that a sign may not be read only once by one scan but it may read to multiple-times authenticity by repetitive scan. optical, electronic, or the scanner based on a mechanical method be independent -- those combination -- be -- it is contained in the range of this invention. These methods are not necessarily limited to the way of carrying out the sweep of the bundle of rays like the scanner indicated by the United States patent quoted before using a mirror.

[0012] Moreover, the scanner 10 is equipped with the photodetector 15 which generates the electric analog signal with which the light reflected from the bar code notation is detected, and detected various intensity of lights are expressed. Since the sweep of the bar code notation is carried out by the bundle of rays, the reflected light has various strength corresponding to the echo from the rod and null of a notation. The output from a photodetector 15 is applied to an amplifier / digitizer 16. As for the gain parameter of amplifier, deciding according to the distance to a target is desirable. The detector 17 connected to the amplifier / digitizer 16 carries out the operation which detects a certain pattern showing a part of bar code notation. The above-mentioned detector 17 is explained with reference to drawing 4 later. In one example of this invention, the output level of a photodetector 15 other than the control signal from a detector 17 can adjust the gain characteristics of an amplifier. This invention is equipped with the amplifier 16 which has the gain characteristics which can be adjusted if it states in detail. It connects with a photodetector 15 and amplifier 16 carries out the operation which changes the comparatively weak electrical signal from a photodetector 15 into the amplified signal. After the amplified signal is digitized, in order to process further according to this invention, it is added to a detector 17. A detector 17 sends the feedback signal which controls the gain characteristics of an amplifier to an amplifier / digitizer 16. one example of this invention -- setting -- a detector 17 -- here -- "laser -- usable -- the output signal called" signal is generated. This signal shows that a part of bar code notation was detected. "laser -- usable -- in order that" signal may correct the optical output from the light source 11, may change a scan angle or may perform the both, it is sent to a controller 14. moreover, "laser -- usable --" signal can be used and the decoding circuit 18 which carries out the operation which decodes the signal received from the photodetector 15 can also be started. The started decoding circuit 18 carries out bias of the detector 17, and receives immediate data from an amplifier / digitizer 16. The data output edge 19 of the decoding circuit 18 can send out the decoded data which are used by the counter system from a scanner. moreover, "laser -- usable --" signal can be used as a feedback signal and the gain characteristics of an amplifier / digitizer 16 can also be controlled.

[0013] Drawing 2 is the easy block diagram of the 2nd example of the scanner by this invention. The light source 11, the current driver 12, a scanner 13, a photodetector 15, and the amplifier/digitizer 16 are the same as the thing explaining drawing 1, and is displayed with the same reference number. As for the example of drawing 1, having the controller 20 with which the structure of a system of the example of drawing 2 generates the laser enable signal 21 according to turning ON the light source 11 by the trigger 22 and the output of the detector circuit 17 differ a little. A trigger 22 is explained later. "the luminescent spot / scan mode is made to start. The laser enable signal 21 which the controller 20 generated is sent to both the current driver 12 and the scanner 13, in order to correct the optical output from the light source 11, in order to make a scan angle change, or in order to perform the both. If started by the output of a detector 17, or one of the triggers 22, a controller 20 will transmit the data which the photodetector 15 generated to the data output line 23, i.e., a connector. Like the example of drawing 1, an enable signal can also be used as a feedback signal which controls the gain characteristics of an amplifier / digitizer 16. drawing 3 (a) - drawing 3 (d) A series of actuation of one example of this invention when scanning a target including a bar code notation by the light source 11 is shown.

[0014] drawing 3 (a) - drawing 3 (d) Although it would come out, this invention performed count, i.e., analysis, about the electrical signal which sampled the light which is easily understood from easy explanation, and which was reflected from a part of target as one description, and was detected, and the detected part is equipped with the detector which can judge whether it means that the bar code notation was detected. The desirable example of this detector 17 is explained later. In order that the reflected light of various strength may judge whether spatial change (it is possible to direct predetermined existences of a sign pattern, such as a bar code notation) of a different reflection factor is expressed, the 1st technique by this invention processes an electrical signal, and generates a test signal. An enable signal will be generated if this test signal is over the predetermined reference signal. According to the enable signal, a bundle of rays is corrected in one or the way beyond it so that it may explain below. The 2nd technique by this invention processes an electrical signal, and generates the count of the number of transition between the sign part parts of the reflection factor from which it differs between predetermined time intervals. It judges whether this count is used and the reflected light of various strength expresses existence of predetermined sign patterns, such as a class of a general bar code notation and bar code notation or a special bar code notation. An enable signal will be generated if a count exceeds the predetermined minimum value. According to this enable signal, a bundle of rays is corrected similarly.

[0015] The 3rd technique by this invention calculates the ratio of the low die length for sign part of a reflection factor, and the die length for sign part of a high reflection factor by processing an electrical signal, in order that the reflected light of various strength may judge whether spatial change (it is possible to direct existence of a predetermined sign pattern) of a different reflection factor is expressed. An enable signal will be generated if the ratio is smaller than a predetermined value. According to this enable signal, a bundle of rays is corrected similarly. In order that the 4th technique by this invention may judge whether the reflected light of various strength expresses spatial change (it is possible to direct existence of a predetermined sign pattern) of almost same different reflection factor in each continuous scan, it processes an electrical signal and compares the signal by the 1st scan with the signal by the following scan of the 2nd. An enable signal will be generated if the comparison during each scan which a predetermined number follows is in agreement exactly. According to this enable signal, a bundle of rays is corrected similarly. Drawing 3 (a) Actuation of the scanner of this invention in the first phase of operation which does not exist in the scanning pattern of the bundle of rays which the coding sign irradiated is shown. Actuation of the scanner of this invention starts in the 2nd phase (drawing 3 b) of operation where a part of coding sign exists in a scanning pattern. That is, if a scanner is moved to a location with a coding sign, a part of coding sign will enter in the scanning pattern of the bundle of rays which came out of the light source 11. A detector 17 detects a part of notation, generates a laser enable signal, and shifts actuation of a scanner to the 3rd phase of operation.

[0016] Drawing 3 (c) Actuation of the equipment of this invention in the 3rd phase of operation which exists in the scanning pattern of the bundle of rays which all coding signs irradiated is shown. The read coding sign is decoded and the decoded data are transmitted so that it may explain later. Drawing 3 (d) After a coding sign is read, actuation of the equipment of this invention in the 4th phase of operation which exists in the scanning pattern of the bundle of rays which a part of coding sign still irradiated is shown. Like a graphic display, at this time, as for a bundle of rays, width of face is narrowed, and that range is a part of coding sign. drawing 3 (a) - drawing 3 (d) This invention sampled the light reflected from a part of target as one description, count, i.e., analysis, was performed and the detected part is equipped with the detector which can judge whether it means that the bar code notation was detected so that I may be easily understood from easy explanation. It is used as a result of [ this ] count (i.e., an analysis result), and a scan angle is changed between the 2nd actuation phase and the 3rd actuation phase and between the 3rd actuation phase and the 4th actuation phase. That is, scan path length can be changed. In the 2nd example, the intensity of light, the luminescent-spot size in datum level, or a scan speed can correct another parameter of a bundle of rays.

[0017] If all coding signs are decoded, it is not necessary to maintain the scan angle 30 (or the intensity of light of a high level from the light source 11 or its both) any longer in the 3rd phase of operation. Therefore, the bundle of rays of the scanner after predetermined time amount passes is drawing 3 (d). It is returned to the almost same configuration as the 1st phase of operation so that it may be shown. In that case, a detector 17 will be made into a disable even if a part of notation is detecting. If actuation of the scanner by this invention is summarized, this invention sampled the light reflected from a part of target as the 1st description, count, i.e., analysis, was performed and the detected part is equipped with the detector which can judge whether it means that the bar code notation was detected. If it judges that the bar code notation was detected, in order to perform scan and decoding actuation thoroughly, some properties of a bundle of rays are corrected. The specific property that a bundle of rays should be corrected is decided by the design of a scanner, the application, and the mode of operation. Before moving to more detailed explanation of the example of this invention, it will be necessary to discuss the description on the design of the laser scanner which has fixed effect on somatization of this invention. There are various technical properties which should be taken into consideration in the design of a laser

scanner, in a scan process, it adjusts using the principle of this invention, and the parts (property of a bundle of rays etc.) can be corrected. Examination of such a technical property is for clarifying possibility of not limiting the range of this invention and applying the technical property of this invention to a laser design factor or specific user special; consideration. After explaining such a technical property, the specific property on activities, such as scan mode, is explained.

[0018] The technical property examined here is the brightness (effective power output), a regulation matter and specification, and the technical performance property (for example, the life of laser, design cost, manufacture possibility, and the similar description) of a laser beam. The brightness of the laser beam reflected from the target front face is the most important parameter in the design of a laser scanner, especially a hand-held laser scanner. A user turns a laser beam to a bar code, and a hand-held laser scanner doubles collimation. It is important that can fully check by looking the bundle of rays to which a user is the basis of the brightness of various perimeters and came out of laser, and collimation doubles, and for actuation to be easy. The brightness of a laser beam is the function of the parameter of a large number which contain the scan path length in which a bundle of rays carries out a sweep in the wavelength (an eye is sensed more sensitive the more to a reflected ray the more especially the wavelength of a red field becomes short, since human being's eyes have the sensibility which changes with wavelength) of a laser beam, luminescent-spot size, a power output, and scan mode. The wavelength of laser diode is comparatively fixed, and since luminescent-spot size is decided by resolution, generally the parameter which an architect can change is only two, a power output and scan die length. About a fixed application, one of these two parameters or both are changeable. A parameter can also be changed periodically working, or a user can do a trigger and can also change it. For example, in scan mode, only when having doubled collimation of a scanner using the time of the user searching for the target, or the bundle of rays, brightness of (this mode of operation is called "collimation" mode) and a laser beam can be made into max.

[0019] Another technical property about a laser scanner is control criteria and specification. Such control criteria have many things related to the magnitude of the power emitted from laser over long duration. For example, U.S. CDRH (the abbreviation for Center for Devices and Radiological Health) has classified laser equipment into four classes (Class I - class IV). The laser of Class I takes out a maximum of 0.39-microwatt radiant power between the time amount for 10,000 seconds or more. This laser is very low power and there is almost no risk in respect of health, i.e., safety. The laser of Class II is 1,000. A maximum of 3.9-microwatt radiant power is taken out between the time amount more than a second. the laser of Class II should avoid "exposure with the language of "caution", and the easy caution label to which the "starburst notation" was attached - laser light comes out from this hole -- " -- it is necessary to attach the aperture label with which the phrase was indicated The phrase which described the language, "don't gaze at laser light", a "class II laser product" and a laser medium, and output power of "caution", and a "starburst notation" are included in the warning logotype of Class II. This invention is useful to meeting the control criteria about radiation of a laser beam certainly. Since the laser by this invention takes out a high-power bundle of rays to comparatively short time amount, in spite of being in control criteria, on datum level, the luminescent spot bright enough which a user can check by looking can be generated, and a user can double collimation of a laser scanner using this luminescent spot. An architect can make the visibility of a laser beam the optimal, selecting appropriately the parameter of the power output of a laser scanner, luminescent-spot size, a scan angle, a scan speed, and others, and meeting the control criteria over the laser of the corresponding class according to constraint of the corresponding regulation.

[0020] Moreover, it can be made to operate in scan mode which is different in a laser scanner using many descriptions of this invention. About the hand-held laser scanner by this invention, there are three possible scan modes, i.e., the luminescent spot / scan mode by the scan mode by the usual trigger and (a) (b) trigger, and (c) target detection scan mode. In the case of the scan mode (a) by the usual trigger, the laser beam is usually off. In this scan mode, a trigger is used and the high-speed iteration scan of a bar code notation is started. having performed the scan about one target many times, in order to have performed right actuation -- or it is necessary to distinguish whether the scan was performed once about two or more targets In order to perform decoding well, the capacity to detect each target which should be scanned in order is indispensable. As everyone knows, in order to repeat a bar code notation many times and to carry out a sweep, in the case of the conventional scanner (for example, equipment given in U.S. Pat. No. 4,387,297), a trigger is pulled, and it operates a scan means each time. The hand-pushed switch of a trigger attached near the joint of the barrel section of housing and a pedicel is desirable. The switch of a trigger is arranged at the pedicel so that a switch can be pushed by the index finger. The sweep of the bar code notation is carried out many times until a scan means reaches a perfect decoder or a perfect time-out, whenever a switch is pushed.

[0021] In the scan mode (a) by the trigger, if a decoding network decodes a bar code notation with the sufficient result, a decoding signal can be generated and the directions means installed in the scanner can be operated. A directions means is the alarm which makes PITSU and a sound, light emitting diode, or its both. If an alarm sounds, if light emitting diode



lights up, or if the both operate, a user will get to know that the scan of the specific notation was completed. In the luminescent spot / scan mode by the trigger (b), if a trigger is pulled, a bundle of rays will come out at a narrow include angle. In this scan mode, the short line whose very bright die length is about 1 inch is formed with the beam of light of the narrow scan angle of laser. Looking at by the eye actually, the user who had a laser scanner in the hand can attach an aim using this bright short line, and can turn a bundle of rays to a location with a bar code notation. After the sign pattern showing a bar code notation is detected, a bundle of rays is expanded so that the sweep of the whole notation may be carried out and it can be decoded. Consequently, decoding is performed, although a reflected ray cannot become gloomy and a user cannot see. Although it is not necessarily required, only when a bright line is on a notation, as for a scanner, it is desirable to detect (it is not on the text or a graph) and a bar code.

[0022] In target detection scan mode (c), there is no trigger in a scanner, and the laser beam of ON is a narrow include angle, and has always come out of the scanner by low power. If the sign pattern showing a bar code notation is detected, in order to read the whole notation, the scan angle of a bundle of rays can extend and power is increased. Any one or all of the above-mentioned modes of operation (a), (b), and (c) is employable as one scanner using the bar code notation detecting method by this invention. The above-mentioned mode of operation may dedication-ize a laser scanner so that a user can also select manually (operating a switch) or it may operate by the specific mode of operation. Moreover, a user can also select a different laser beam output and a different scan parameter (in the strength of a beam of light, it is a scan angle etc.) manually (operating a switch), or in the scanner of a specific format, they can be determined automatically and can also be dedication-ized. Moreover, determining the scan parameter of a specific format automatically is also considered by analyzing the detected bar code notation. Moreover, the scan mode which was most suitable for detecting the whole bar code notation most effectively and appropriately can be determined using a calculating-machine algorithm. All of these alternative examples are contained in the range of this invention.

[0023] Drawing 4 is the schematic drawing of the desirable example of the detector 17 by this invention. The signal from an amplifier / digitizer 16 is added to the input edge of an inverter 31, and the output of an inverter 31 is applied to diode 32. The 1st resistor R1 A capacitor 34 forms an RC circuit and is a resistor R1. It connects with the serial between the outgoing end of diode 32, and the 1st input edge 35 of the release collector output comparator 37. The capacitor 34 is connected with the 1st input edge 35 between touch-down potentials. The 2nd resistor R2 It connects with the 1st input edge 35 between touch-down potentials. Resistor R1 As for resistance, it is desirable that it is quite smaller than the resistance of a resistor R2. The 2nd input edge 38 of a comparator is the resistor R4 connected to the serial between potential V and touch-down. R5 It connects with the node of the constituted potentiometer. the outgoing end 41 of a comparator 37 -- "laser -- usable --" signal line and resistor R3 It connects with the feed back line along which it passes. Resistor R3 Since other terminals are connected to the 2nd input edge 38 of a comparator 37, the feedback from the outgoing end of a comparator 37 gives the hysteresis effectiveness to actuation of a comparator. The actuation of a detector 17 is as follows. namely, -- if a digitizer outputs a rod -- R2 R1 since it is quite large -- a capacitor -- about -- it stores electricity with the time constant of R1 C. When a digitizer outputs a null, 32 is diodeR1. Since the discharge along which it passes is barred, a capacitor is R2. It leads and discharges. Time constant R2 C is made quite larger than time constant R1 C so that much null time amount may be required to cancel the effectiveness of a rod. The electrical potential difference more than the threshold set up by the activity of a comparator 37 appears in a capacitor 34 after some rods of a typical consistency, and the scan of a null. At this event, in order to direct existence of a bar code, a "trigger" signal, i.e., a laser enable signal, is outputted from a comparator 37.

[0024] At this event, the release collector output of a comparator 37 is driven to a low value, and lowers the threshold of a comparator so that the small electrical-potential-difference change on the capacitor 34 produced by a rod, a next null, and a next quiescence area may not make a trigger signal a disable. The trigger of the circuit will be similarly carried out, as stated above, though the long black rod might be scanned. However, the digitizer is equipped with the circuit which identifies the read of a long black rod in the desirable example. That is, a digitizer functions as a high-pass filter. Even if a long black rod is scanned, a time-out will be used for the above-mentioned digitizer circuit so that only a short panel may be made. If this short pulse signal is added to a detector 17, a threshold is not exceeded and the "trigger" signal will not be outputted. A trigger signal is canceled after all after the considerable long time amount in which the digitized rod does not exist. If a scanner is kept away from a bar code notation, it directs not to scan the notation with the already same trigger signal of which a capacitor discharges through R2 C and a laser enable signal is canceled to a DIKODINGU logical circuit or a detector.

[0025] It is one of the important descriptions of this invention that the bar code detector shown in drawing 4 is sensitive to a specific image pattern. A detector answers a powerful reflected light signal and a weak reflected light signal, and a capacitor 34 is charged or it discharges. If a fixed threshold is reached, a net charge will be used in order to generate a trigger signal. Drawing 6 (a) It is the enlarged drawing of a rod and the pattern of a null which exists in a typical



notation. Drawing 6 (b) Drawing 6 (a) When a notation is scanned from the left to the right, it is the graph which showed the electrical potential difference on a line (the 1st input edge of a comparator) 35 as a function of time amount. When it states in detail and a rod 50 is scanned, it turns out that an electrical potential difference increases somewhat linearly so that it may see in Period a. When a null is scanned, it is a resistor R1 like Period b. The charge which it leads, and a charge is not added to Capacitor C, but exists in Capacitor C is a resistor R2. It leads and discharges slowly. When it meets with the following rod 51 in Period c, an electrical potential difference is impressed again and it is a resistor R1. It leads and Capacitor C is charged. When it meets with the following null in Period d while a trigger signal scans, it is a resistor R1. The charge which it leads, and a charge is not added to Capacitor C, but exists in Capacitor C is a resistor R2 similarly. It leads and discharges slowly. When it meets with the following double-width rod 53 in Period e during a scan, an electrical potential difference is impressed similarly and it is a resistor R1. It leads and Capacitor C is charged. drawing 6 (b) from -- it understands -- as -- Period e -- setting -- the full voltage on a line 35 -- threshold electrical potential difference  $V_t$  It has exceeded. Full voltage is the threshold electrical potential difference  $V_t$ . When exceeded, it is drawing 6 (c). When a trigger signal moves from a high price to a low value, a trigger enable signal is started so that it may be shown. The electrical potential difference on a line 35 continues increasing in the period e when a rod 53 is scanned. It sets at the period f when the null is scanned, and is a resistor R1. The charge which it leads, and a charge is not impressed to Capacitor C, but exists in Capacitor C is a resistor R2. It leads and discharges slowly. When it meets with the following rod 54 in Period g, it is a resistor R1 similarly. It lets it pass, an electrical potential difference is impressed, and a capacitor is charged.

[0026] In the example of this invention, the circuit which turns ON laser at the shape of a pulse can be prepared between the time amount long enough thoroughly scanned once from the edge of a visual field to an edge. Next, a circuit turns OFF laser between fixed time amount, before repeating a cycle. The laser usable output of the circuit of drawing 4 is latched in the end of the period whose laser is ON. Latch's output is used within a scanner as a laser usable output. Since it does not change until the following laser "on" period finishes latch's output, the effect of what does not exert discharge of the capacitor C in a laser "off" period on latch's output; either. A parameter R1, R2, and C should be appropriately selected so that the electrical potential difference which joins Capacitor C may reach in 1 scan time at a steady state. In Period g, the electrical potential difference concerning Capacitor C reaches the steady-state value near the maximum of  $V(1 - \exp(-t/RC))$ , i.e., V. An electrical potential difference takes the value near V until a bar code already disappears from the visual field of a photodetector 15. If a bar code disappears, as the period h of drawing 4 shows, a capacitor will discharge. The laser enable signal added to a controller 14 or 20 can be used for detecting the pattern of a specific spatial change through the suitable hardware or the software formed in a controller 14 or 20. For example, a controller 14 or 20 can be equipped with the suitable logical circuit which counts the number of transition between the sign part parts from which the reflection factor in a predetermined period differs by choosing the parameter of a detector 17 appropriately. This count is used for judging whether the light reflected from a part for the sign part of a different reflection factor expresses predetermined existences of a sign pattern, such as a general bar code notation. Moreover, since it judges whether a controller 14 or 20 expresses spatial change (it is possible to express existence of a predetermined sign pattern) of the reflection factor from which the reflected light of various strength differs, the ratio of the die length for sign part of a high reflection factor and the die length for sign part of a low reflection factor is calculated, and an enable signal can be generated if the ratio is smaller than a predetermined value.

[0027] The reflected light of various strength in each continuous scan a controller 14 or 20 as another utilization In order to judge whether spatial change (it is possible to express existence of a predetermined sign pattern) of almost same different reflection factor is expressed, The signal from the 1st scan is compared with the signal from the 2nd subsequent scan, and an enable signal can be generated if the comparison during each scan which a predetermined number follows is in agreement exactly. Drawing 5 is the actuation current  $I_d$  about the source mode output of the semiconductor laser used as the light source. It is the graph with which it expressed as a function. If it explains in detail, it is a transition point It. The threshold current point of laser is shown. If the laser diode current is increased, the power output by spontaneous emission will increase comparatively slowly. If it passes over a threshold current point, since laser oscillation will start, an output increases rapidly. According to this invention, it is two operating current points I1 and I2. It exists. As for both, it is desirable that it is in a laser oscillation field. Moreover, I1 It is possible to also make it operate at a current point which is in a spontaneous emission field.

[Translation done.]

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## DESCRIPTION OF DRAWINGS

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### [Brief Description of the Drawings]

[Drawing 1] The easy block diagram of the 1st example of the scanner which reads coding signs, such as a bar code notation, according to this invention.

[Drawing 2] The easy block diagram of the 2nd example of the scanner which reads coding signs, such as a bar code notation, according to this invention.

[Drawing 3] (a) Schematic drawing showing actuation of the scanner of this invention in the 1st actuation phase where a coding sign does not exist in the scanning pattern of laser light.

(b) Schematic drawing showing actuation of the scanner of this invention in the 2nd actuation phase where a part of coding sign exists in the scanning pattern of laser light.

(c) Schematic drawing showing actuation of the scanner of this invention in the 3rd actuation phase where all of coding signs exist in the scanning pattern of laser light.

(d) Schematic drawing showing actuation of the scanner of this invention in the 4th actuation phase where a part of coding sign exists in the scanning pattern of laser light in addition.

[Drawing 4] Schematic drawing of the detector used for the scanner of this invention.

[Drawing 5] The graph of the power output of the semiconductor laser used for the scanner of this invention as the light source.

[Drawing 6] (a) The enlarged drawing of the rod of a typical notation, and the pattern of a null.

(b) \*\*\*\*6 (a) A graph with the easy electrical potential difference in the internal node of the detector corresponding to the scan of the shown bar code notation, and (c) Drawing 6 (a) When a bar code notation is scanned from the left to the right, it is the graph of the enable signal expressed with the function of time amount.

### [Description of Notations]

10 Scanner

11 Light Source

12 Current Driver

13 Scanner

14 Controller

15 Photodetector

16 Amplifier/Digitizer

17 Detector

18 Decoding Circuit

19 Data Output

20 Controller

21 Laser Enable Signal

22 Trigger

23 Data Output

30 Scan Angle

31 Inverter

32 Diode

34 Capacitor

35 1st Input Edge

37 Comparator

38 2nd Input Edge

41 Outgoing End

50, 51, 53, 54 Rod of a bar code notation

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[Translation done.]

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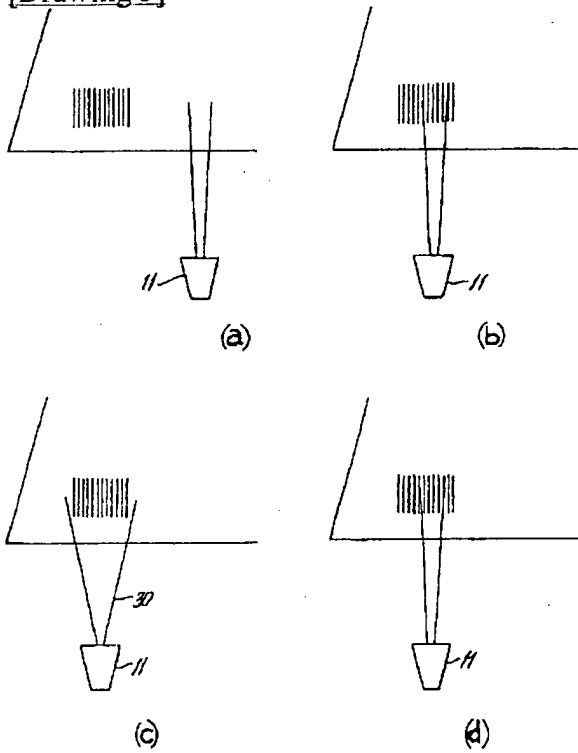
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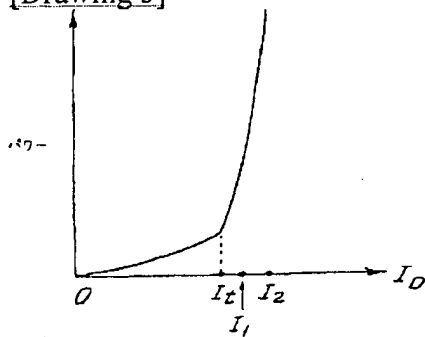
DRAWINGS

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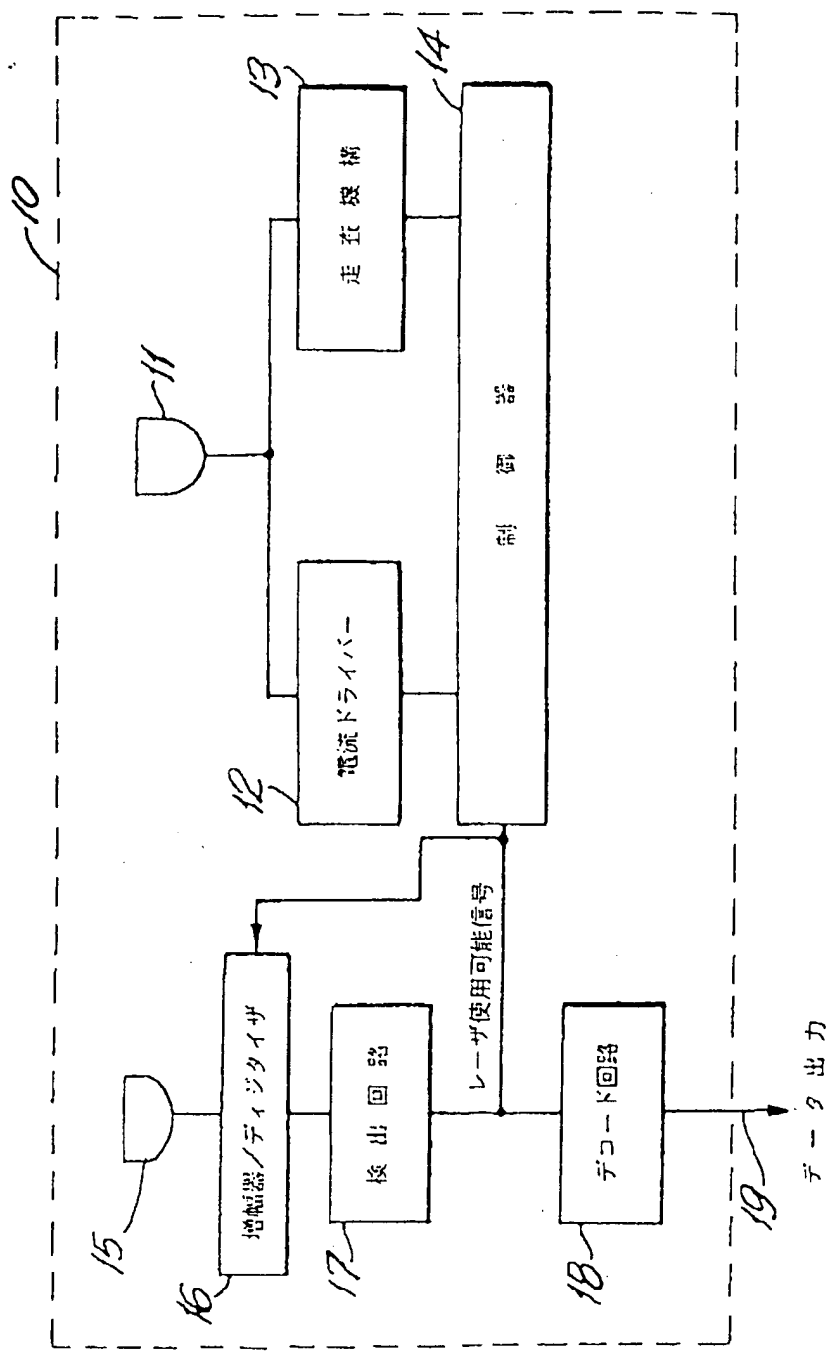
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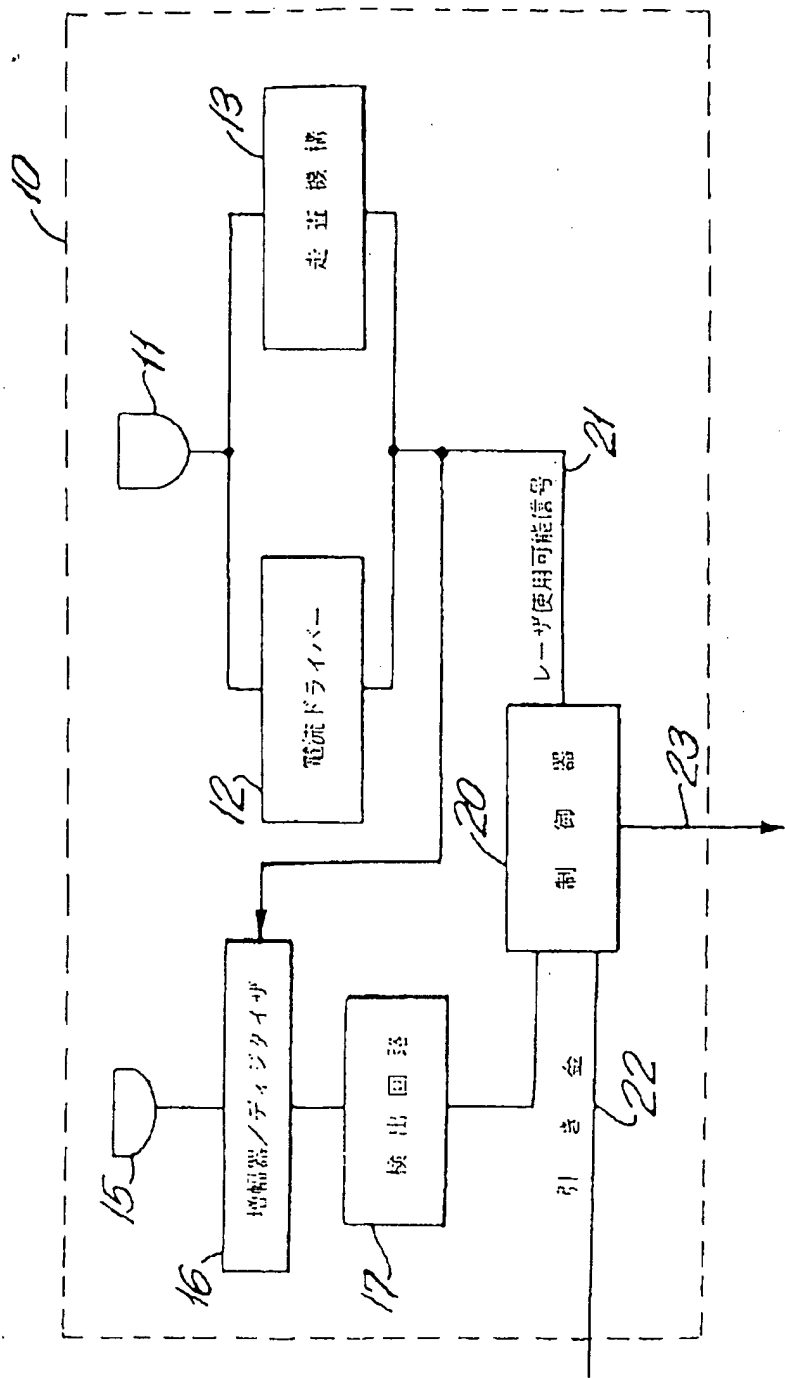
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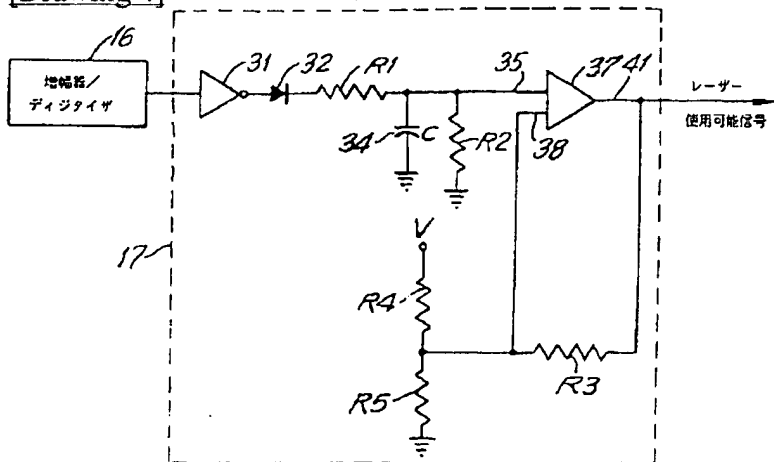
[Drawing 1]



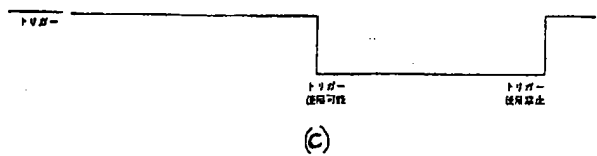
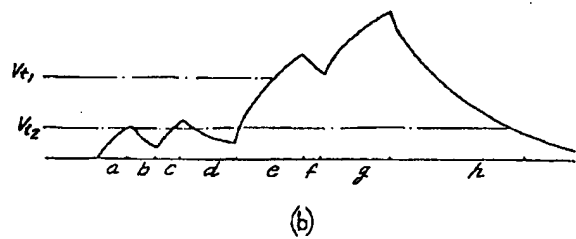
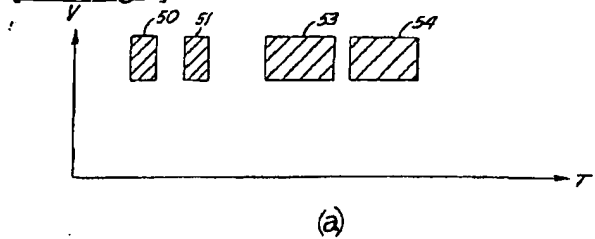
[Drawing 2]



[Drawing 4]



[Drawing 6]



[Translation done.]